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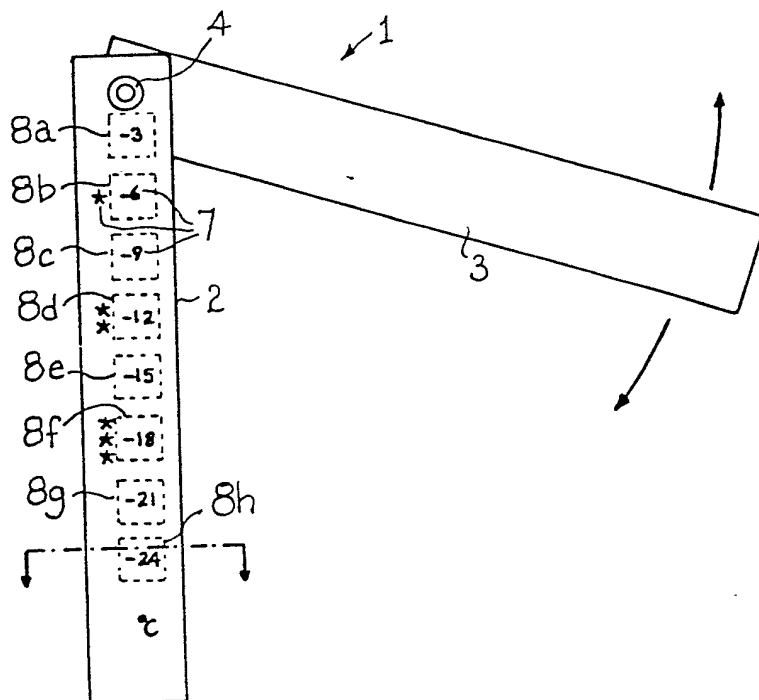
(56) Documents cited
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(58) Field of search
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Online databases; WPI

(54) **Liquid crystal temperature indicating device**

(57) A liquid crystal temperature sensing device (1) comprises a display member (2) having a number of liquid crystal portions (8a-h) and tagging means (3) in the form of a strip, tassel cord or the like for assisting locating the display member when the latter is covered in a freezer, refrigerator or the like.

FIG. 1



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FIG. 1

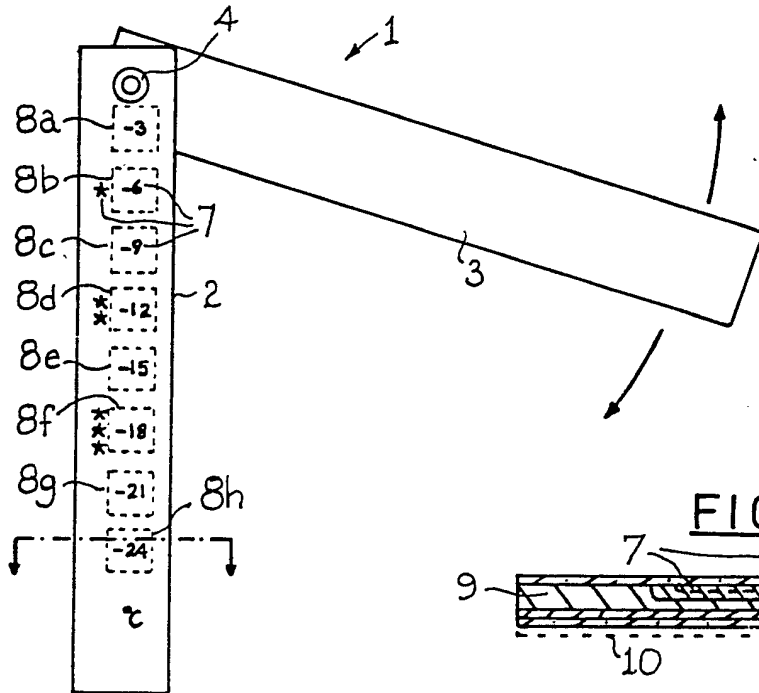


FIG. 2

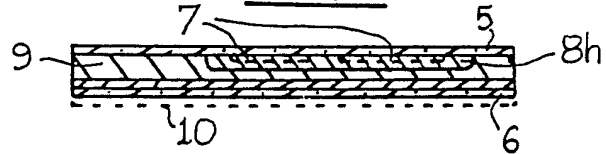


FIG. 3

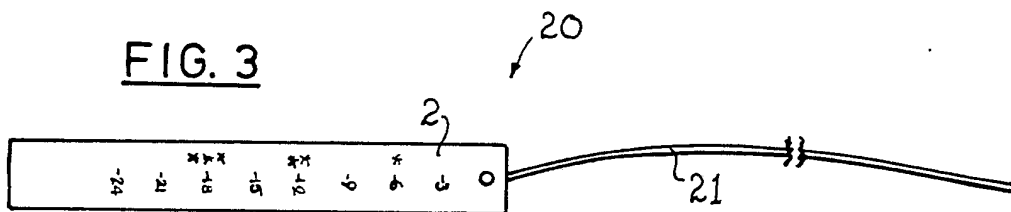
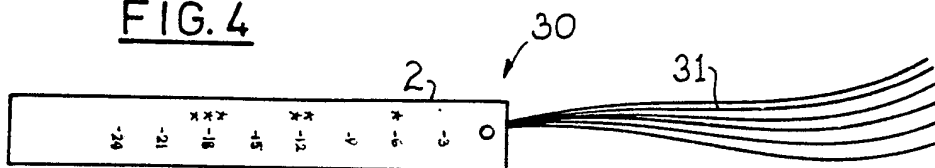


FIG. 4



Liquid Crystal temperature indicating device

This invention relates to a liquid crystal temperature indicating device. In particular, but not exclusively, the device is intended for indicating the temperature of food products, packaged or otherwise, stored in a refrigerated compartment, e.g. a freezer, refrigerator, refrigerated cabinet or the like. The invention also relates to a method of measuring the temperature of food products in a refrigerated compartment.

10 It is already known to use liquid crystal thermometers in freezers and refrigerators to provide a visual indication of the air temperature within the freezer or refrigerator. Generally such thermometers are mounted within the freezer or refrigerator to provide a continuous display and are not intended to be covered or obscured by food products stored in the freezer or refrigerator.

It is often desirable, however, to be able to measure the temperature of articles, e.g. food products, stored within a compartment, e.g. a refrigerated compartment. In order to be able to measure the temperature of such stored articles, it is necessary to position a temperature sensing device within the compartment so that it is covered by the stored articles and to leave the device for a sufficient length of time to respond to the temperature of the articles being measured. In this length of time, however, a user may forget where the covered temperature sensing device had been located. Such a problem might occur when testing the temperatures of products in a large number of compartments, e.g. when testing the temperature of food products stored in a plurality of freezers or refrigerated compartments of a retail outlet.

The present invention seeks to provide a solution to the above-identified problem.

According to one aspect of the present invention a liquid crystal temperature indicating device comprises a temperature sensing and display member including a number of liquid crystal portions each having a visually perceptible condition for indicating a specific temperature or temperature range and tagging means connected to the said member for marking the position of the said member when the latter is covered by an article whose temperature is intended to be measured.

10 In use the temperature sensing and display member is intended to be positioned underneath an article whose temperature is to be measured. For instance when used to measure the temperature of food products stored in a refrigerated compartment, the temperature sensing and display member is intended to be sandwiched between two food products. Although the temperature sensing and tagging means are not intended to be covered and serve to identify precisely where the temperature sensing and display member is located.

Conveniently the tagging means is movable relative to the temperature sensing and display member. For example the tagging means may comprise a tassel, cord or other flexible means. Alternatively the temperature sensing and display member may be pivotally mounted to the tagging means for swiveling movement relative to the latter.

Suitably the temperature sensing and display member is of strip form having one end attached to the tagging means. In the case where the tagging means is pivotally attached to the said member, the tagging means is conveniently also of strip form and conveniently is also of approximately the same size as the said member.

Preferably the temperature sensing and display member is

flexible. In this manner the member is able to conform to the shape of an article whose temperature is to be measured thereby ensuring good heat transfer between the member and article when the article contacts the member. Heat transfer can be further improved if the said member is provided with a metallic backing, e.g. an aluminium backing sheet.

Preferably the tagging means is brightly coloured.

Preferably the said liquid crystal portions are designed to sense and display temperatures within a wide temperature range including a range of from -6°C to -18°C , typically from -3°C to -24°C .

According to another aspect of the present invention a method of measuring the temperature of food products stored in a refrigerated compartment comprises positioning a temperature indicating device according to said one aspect of the invention in the refrigerated compartment with the said member positioned so as to be at least partly obscured by one or more of said food products and with said tagging means positioned so as to be readily visible so as to identify the position of said at least partly obscured temperature sensing and display member and inspecting the said member after a period of time to determine the sensed temperature of said food products.

Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawing, in which

Figure 1 is a view from above of one embodiment of a liquid crystal temperature indicating device according to the invention,

Figure 2 is a view, on an enlarged scale, taken on the line II-II of Figure 1, and

Figures 3 and 4 are schematic views illustrating two alternative embodiments of a liquid crystal temperature indicating device according to the invention.

5 Figure 1 shows one embodiment of a liquid crystal freezer thermometer generally designated by the reference numeral 1 comprising a rectangular temperature sensing and display strip 2 attached to a substantially similarly sized tag 3 by means of a rivet 4 which enables the strip 2 to
10 swivel with respect to the tag 3.

As can be seen in Figure 2, the strip 2 comprises transparent spaced apart top and bottom layers 5 and 6 of gloss or matt surfaced PVC sheet material which has been surface modified to reduce static and to enable ink systems
15 to key directly onto the modified surface. Printed matter 7, in the form of temperatures in °C and symbols "*" denoting the temperature at which a product should be stored, is printed onto the inner surface of layer 5. In addition eight substantially rectangular temperature indicating
20 areas 8a to 8h are printed onto the inner surface of the layer 5. Each area 8a to 8h comprises a different liquid crystal composition designed to display a certain colour within a different temperature range. In the embodiment shown, the different areas are intended to display a
25 greenish colour when their temperatures are, respectively, $-3 \pm 1.5^{\circ}\text{C}$, $-6 \pm 1.5^{\circ}\text{C}$, $-9 \pm 1.5^{\circ}\text{C}$, $-12 \pm 1.5^{\circ}\text{C}$, $-15 \pm 1.5^{\circ}\text{C}$, $-18 \pm 1.5^{\circ}\text{C}$, $-21 \pm 1.5^{\circ}\text{C}$ and $-24 \pm 1.5^{\circ}\text{C}$. A backing layer 9 of black ink is printed over the entire layer 5 before the layer 6 is adhered thereto. A sheet 10 (shown in dashed
30 lines in Figure 2) of flexible aluminium may be adhered to the backing sheet 6.

The precise form of the strip 2 is not important and any flexible strip employing liquid crystal temperature indicating regions capable of indicating temperatures below
35 0°C and down to at least -18°C , typically at least -24°C ,

can be employed.

The tag 3 is preferably brightly coloured, e.g. red, to enable the device to be easily located when the strip 2 is positioned in a refrigerated compartment beneath food articles. As previously mentioned, the strip 2 is attached to the tag 3 in such a manner as to be able to swivel with respect to the tag. Thus the strip 2 can be swiveled between a "home" or storage position in which the strip and tag are similarly orientated or a fully opened position in which the strip 2 is swivelled through 180° relative to the tag 3. This enables the position of the tag 3 to be adjusted to a desired position when the strip 2 is positioned in a refrigerated compartment, e.g. sandwiched between two food products.

In use the tag 3 is intended to provide a visual identification of where an at least partly obscured strip 2 is located in an article storage compartment, e.g. in a refrigerated compartment of a freezer or the like.

Figures 3 and 4 illustrate other embodiments of a temperature indicating device according to the invention employing different types of tag. The device 20 shown in Figure 3 has a flexible cord 21 attached to the strip 2 whereas the device 30 shown in Figure 4 has a tassel 31 attached to the strip 2.

Although the invention is primarily concerned with freezer thermometers or the like the invention may have other applications where it is desired to monitor the temperature of articles stored in a temperature controlled environment.

CLAIMS

1. A liquid crystal temperature indicating device comprising a temperature sensing and display member including a number of liquid crystal portions each having a visually perceptible condition for indicating a specific temperature or temperature range, characterised in that the device further comprises tagging means connected to the said member for marking the position of the said member when the latter is covered by an article whose temperature is intended to be measured.

2. A device according to claim 1, characterised in that the tagging means is movable relative to the temperature sensing and display member.

3. A device according to claim 2, characterised in that the tagging means comprises flexible means in the form of a tassel, cord or the like.

4. A device according to claim 2, characterised in that the temperature sensing and display member is pivotally mounted to the tagging means for swiveling movement relative to the latter.

5. A device according to any one of the preceding claims, characterised in that the temperature sensing and display member is of strip form having one end attached to the tagging means.

6. A device according to claims 4 and 5, characterised in that the tagging means is also of strip form.

7. A device according to any one of the preceding claims, characterised in that the temperature sensing and display member is flexible.

8. A device according to claim 7, characterised in that the said member is provided with a metallic backing.

9. A device according to any one of the preceding claims, characterised in that the tagging means is brightly
5 coloured.

10. A device according to any one of the preceding claims, characterised in that the said liquid crystal portions are designed to sense and display temperatures within a wide temperature range including a range of from-
10 6°C to -18°C.

11. A device according to claim 10, characterised in that the said wide temperature range includes a range of from -3°C to -24°C.

12. A liquid crystal temperature indicating device
15 constructed and arranged substantially as herein described with reference to, and as illustrated in, Figures 1 and 2 or Figures 1 and 2 as modified by Figure 2 or 3.

13. A method of measuring the temperature of food products stored in a refrigerated compartment characterised
20 by positioning a temperature indicating device according to claim 1 in the refrigerated compartment with the said member positioned so as to be at least partly obscured by one or more of said food products and with said tagging means positioned so as to be readily visible so as to
25 identify the position of said at least partly obscured temperature sensing and display member and inspecting the said member after a period of time to determine the sensed temperature of said food products.

CLAIMS

1. A liquid crystal temperature indicating device comprising a temperature sensing and display member including a number of liquid crystal portions each having a visually perceptible condition for indicating a specific temperature or temperature range, characterised in that the device further comprises tagging means connected to, and movable relative to, the said member for marking the position of the said member when the latter is covered by an article whose temperature is intended to be measured.

2. A device according to claim 1, characterised in that the tagging means comprises flexible means in the form of a tassel, cord or the like.

3. A device according to claim 1, characterised in that the temperature sensing and display member is pivotally mounted to the tagging means for swiveling movement relative to the latter.

4. A device according to claim 2 or 3, characterised in that the temperature sensing and display member is of strip form having one end attached to the tagging means.

5. A device according to claims 3 and 4, characterised in that the tagging means is also of strip form.

6. A device according to any one of the preceding claims, characterised in that the temperature sensing and display member is flexible.

7. A device according to claim 6, characterised in that the said member is provided with a metallic backing.

8. A device according to any one of the preceding

claims, characterised in that the tagging means is brightly coloured.

9. A device according to any one of the preceding claims, characterised in that the said liquid crystal
5 portions are designed to sense and display temperatures within a wide temperature range including a range of from -6°C to -18°C .

10. A device according to claim 9, characterised in that the said wide temperature range includes a range of
10 from -3°C to -24°C .

11. A liquid crystal temperature indicating device constructed and arranged substantially as herein described with reference to, and as illustrated in, Figures 1 and 2 or Figures 1 and 2 as modified by Figure 2 or 3.

15 12. A method of measuring the temperature of food products stored in a refrigerated compartment characterised by positioning a temperature indicating device according to claim 1 in the refrigerated compartment with the said member positioned so as to be at least partly obscured by
20 one or more of said food products and with said tagging means positioned so as to be readily visible so as to identify the position of said at least partly obscured temperature sensing and display member and inspecting the said member after a period of time to determine the sensed
25 temperature of said food products.